

# Regulatory Intelligence Assistant for Public Service

A Submission for the G7 GovAI Grand Challenge 2025

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Answering Challenge Statement 2: "Navigating Complex Regulations"



# The Regulatory Maze: A Crisis of Complexity and Cost

Navigating regulations is a critical but broken process. Public servants and citizens spend countless hours deciphering dense legal text, leading to significant consequences:



## Lost Productivity

Critical time is wasted on manual research instead of service delivery.



## Compliance Errors

Misinterpretations lead to costly mistakes for both government and applicants.



## Delayed Services

Application backlogs grow, hindering access to essential programs and benefits.



## Erosion of Trust

A system that is difficult to understand feels inaccessible and unfair.

# A Future of Clarity and Efficiency

**-80%**

Reduction in time to find relevant regulations

**-70%**

Reduction in compliance errors

**+80%**

Improvement in regulatory clarity

**+90%**

User satisfaction with search results

Our vision is a system that transforms the regulatory landscape from an obstacle into an asset. We aim to deliver an intelligent assistant that provides instant, accurate, and understandable answers, empowering users and streamlining public service.

# Our Solution: An AI-Powered Regulatory Intelligence Assistant

We have built an end-to-end system that combines knowledge graphs, semantic search, and **AI-powered Q&A** to make regulations accessible and actionable for everyone.



## Regulatory Knowledge Graph

See the hidden connections between regulations.



## Semantic Search

Ask questions in plain language and find what you need instantly.



## AI-Powered Q&A

Get clear answers with direct citations from the source.



## Compliance Checking

Proactively identify and resolve compliance issues in real time.



## Guided Workflows

Navigate complex application processes with step-by-step assistance.

# Finding the Needle: Semantic Search Powered by a Knowledge Graph



## 1. Knowledge Graph Foundation

We model the entire regulatory landscape in a Neo4j graph database, mapping all interconnections, amendments, and cross-references.



## 2. Hybrid Search Engine

We combine keyword (BM25) and vector (semantic) search in Elasticsearch for precision and relevance.



## 3. Natural Language Queries

The system understands user intent, finding not just keywords but the underlying meaning in their questions.

eligibility for parental leave under the Canada Labour Code

Ask a question in plain language...

Jurisdiction

Federal

Provincial

Date

Department

Employment and Social Development Canada

Canada Labour Code - Section 206.1 - Maternity and Parental Leave

...an employee is entitled to a leave of absence from employment to care for a new-born child...

CLC s. 206.1

EIA s. 23

Amended by S.C. 2021, c. 23

Employment Insurance Act - Section 23 - Parental Benefits

# Understanding the Answer: RAG-Powered Q&A with Verifiable Citations

Our Retrieval-Augmented Generation (RAG) system uses the Gemini API to provide direct, plain-language answers to complex regulatory questions, always supported by direct citations to the source law.

Can a temporary resident apply for employment insurance?

Yes, temporary residents can apply for employment insurance if they have a valid work permit. According to Section 7(1) of the Employment Insurance Act, benefits are payable to insured persons who meet the eligibility requirements...

## Sources

- [1] [Employment Insurance Act, S.C. 1996, c. 23, s. 7\(1\)](#)



Confidence: **High**

# Ensuring Accuracy: The Proactive Compliance Engine

We move beyond simple search to active compliance. Our engine automatically extracts requirements from regulatory text and validates user input in real time.

## Key Capabilities



- **Requirement Extraction:** Automatically identifies 4 pattern types (mandatory, prohibited, conditional, eligibility) from regulations.
- **Real-time Validation:** Provides sub-50ms feedback on 8 different validation types as users complete forms.
- **Intelligent Reporting:** Generates actionable reports detailing compliance issues, citing specific regulations, and suggesting resolutions.



Section C: Financial Attestation

Applicant Name

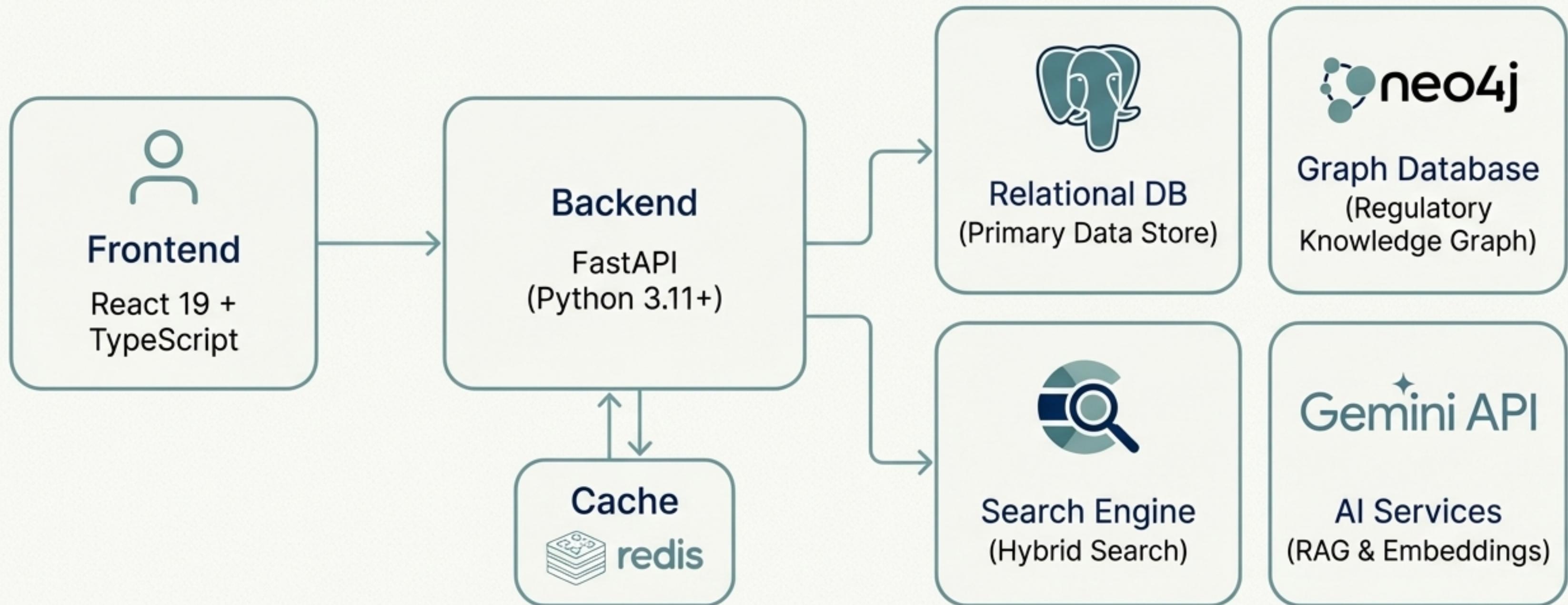
SIN

Total Income

 ! This field is required under the Financial Administration Act, Section 34(1)(a).

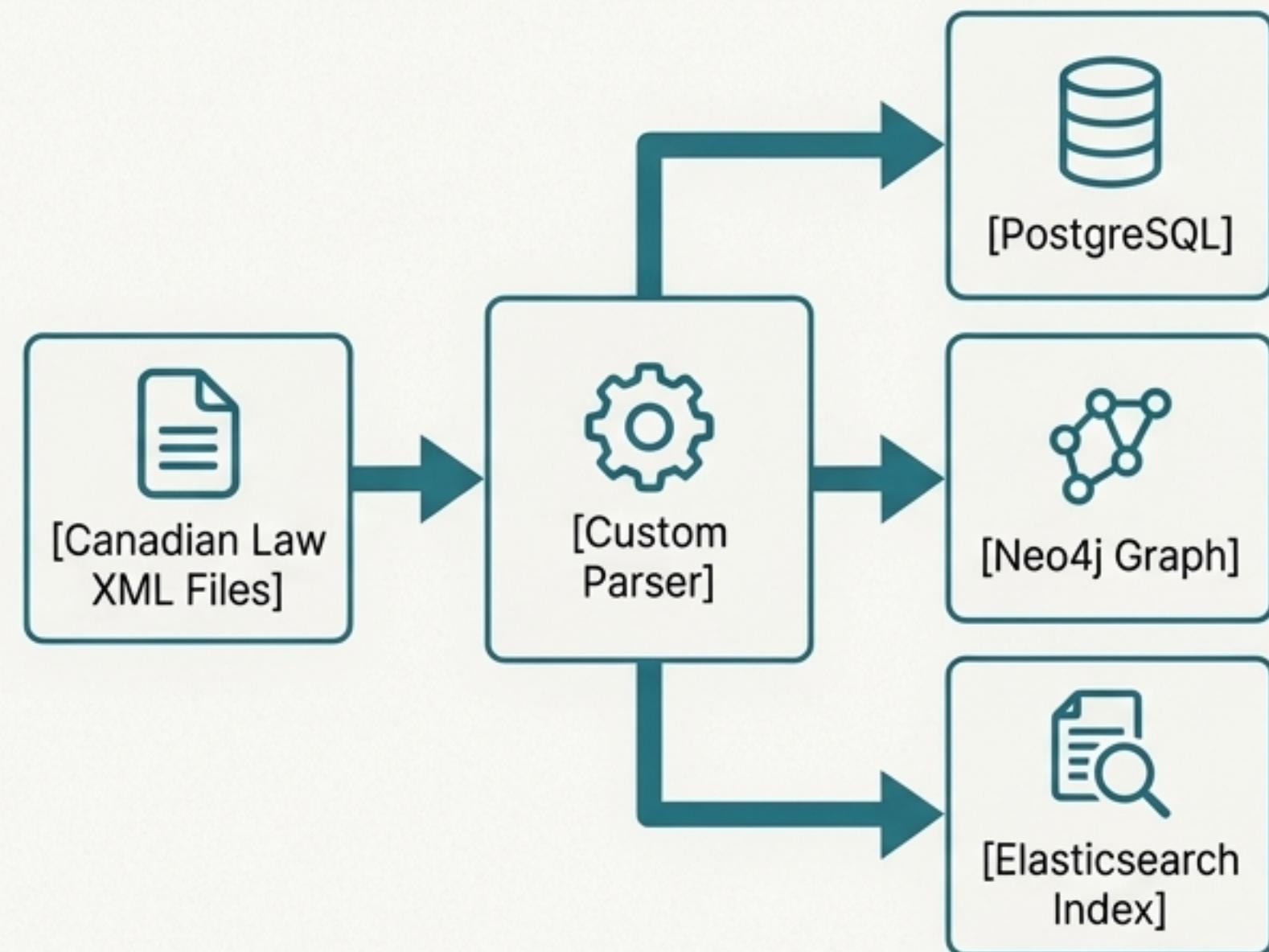
Declaration of Funds

# Built to Perform: A Modern, Scalable Architecture



# The Foundation: A Resilient Data Ingestion Pipeline

- Specialized Parser:** Custom-built for Justice Laws Canada XML format, handling sections, amendments, and cross-references.
- Multi-Database Loading:** Ingests, processes, and structures data simultaneously for PostgreSQL, Neo4j, and Elasticsearch.
- Deduplication & Resilience:** Uses SHA-256 hashing to prevent duplicates and gracefully handles file-level errors.
- MVP Data Set:** Successfully ingested 10 priority Canadian Federal Acts, including the Income Tax Act and Canada Labour Code.



# Disciplined Execution: From Concept to MVP in Two Weeks

Our 4-person team utilized parallel work streams to deliver a feature-complete MVP within a 14-day sprint.



# Tangible Results: MVP Development is 95% Complete



MVP Development Complete - Ready for Testing!

Phase 1: Foundation (Days 1-2)



✓ COMPLETE

Phase 2: Document Processing (Days 3-4)



✓ COMPLETE

Phase 3: Search & RAG (Days 5-7)



✓ COMPLETE

Phase 4: Compliance & Frontend (Days 8-11)



✓ COMPLETE

Phase 5: Testing & Demo (Days 12-14)



⌚ IN PROGRESS

50+

REST API Endpoints  
Operational

4

Fully Functional React Pages  
(Dashboard, Search, Chat,  
Compliance)

10

Core Canadian Federal  
Acts Ingested

# A Commitment to Quality: Rigorous, Multi-Layered Testing

Quality is not an afterthought. We implemented a comprehensive testing strategy across the entire stack to ensure reliability, accuracy, and performance.

## Backend Testing (pytest)

**285** Total Tests Executed

**100% Pass Rate** on core services: Compliance Engine, Query Parser, RAG Service, Legal NLP.

**Coverage:** Unit and Integration tests for all services.

## Frontend Testing (Playwright)

**29** End-to-End Tests

**Coverage:** All pages (Dashboard, Search, Chat).

**Cross-Browser:** Tested on Chromium, Firefox, WebKit, and mobile emulators.

## Quality & Accuracy Metrics

**Target: >80%**  
Search Precision@10

**Target: >95%**  
RAG Citation Accuracy

**Target: <50ms**  
Real-time Field Validation

# The Impact: Delivering Measurable Value



Time Savings



Quality & Accuracy



User Empowerment

**-60-80%**

Search Time

**-50-70%**

Compliance Errors

**+80%**

User Confidence

**-40-60%**

Application Processing

**+40-60%**

Application Accuracy

**+70%**

Self-Service Success

# A Solution for the Entire Public Service Ecosystem



## Caseworkers

- Instantly find applicable regulations and eligibility criteria.
- Check application compliance in real time.



## Policy Analysts

- Analyze the regulatory landscape and track changes over time.
- Discover interconnected policies and precedents.



## Citizens & Businesses

- Understand requirements in plain language.
- Get step-by-step guidance through complex processes.



## Legal Researchers

- Search across jurisdictions and track legislative amendments.
- Visually explore cross-references and relationships.



# From Complexity to Clarity: The Future of Regulatory Intelligence

The Regulatory Intelligence Assistant is not just a concept, but a complete, tested, and high-impact MVP. It is the definitive solution to navigating complex regulations, ready to empower public servants and citizens across the G7.

